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THESIS

PREDICTING BUSINESS FAILURE:
IDENTIFYING HIGH-RISK CONTRACTORS

by

William McKinley Matthews

June 1985

Thesis Advisor:

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Predicting Business Failure:
Identifying High-Risk Contractors

by

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Lieutenant, United States Navy
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Submitted in partial fulfillment of the
requirements for the degree of

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June 1983

ABSTRACT

The purpose of this thesis is to examine the usefulness of the qualitative information found in annual financial reports for making predictions about corporate failure. The content of the presidents' cover letters for a matched pair of firms, failed versus non-failed, spanning the five-year period prior to failure were analyzed and scored for integrative complexity. The major finding was that a firm may be identified as a probable candidate for failure as many as five years prior to the time of entering bankruptcy proceedings. When employed in conjunction with current prescribed analytical techniques utilized by Department of Defense contracting and purchasing officials in determining a contractor's capacity to perform, this technique may prove useful in identifying high-risk contractors, thereby reducing the risk of financial loss to the government.

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I. INTRODUCTION

Several factors have combined to make the tasks of contracting and acquisition within the Department of Defense (DOD) complicated and of high financial risk. As noted in a recent General Accounting Office (GAO) report (1982) and in the weekly Federal Contract Report (1983), DOD is dividing its growing defense budget among an increasing number of civilian manufacturers and contractors. At the same time, mounting political and public pressures are causing DOD managers to be aware of the need to increase effectiveness and efficiency and also to reduce fraud, waste, and abuse (GAO, 1982). Add a sagging U.S. economy that has recently given rise to a near record number of business failures (Wall Street Journal, 1983) and it becomes obvious that deciding with whom DOD should do business is not a trivial issue. In an effort to reduce the risk of financial loss, DOD has set forth policy guidelines and specific rules for its representatives to follow during the contracting process.

A. DEPARTMENT OF DEFENSE POLICY

A fundamental policy of the Department of Defense is to do business only with responsible contractors. In accordance with the guidelines established in DOD's Defense Acquisition

Acquisition Regulation (DAR), the purchasing office that selects the source and makes the award is charged with adhering to this policy. To aid in this crucial judgment, DOD has established a number of standards that must be met before a prospective contractor can be considered responsible. A complete description of the minimum standards for responsibility can be found in the Defense Acquisition Regulation (DAR). One of these standards deals specifically with the issue of determining a contractor's financial capability. This thesis investigates one method that may be helpful in that determination.

B. THE REQUIREMENT FOR FINANCIAL CAPABILITY

Defense Acquisition Regulation 1-903 states that, in order to be eligible for award, a prospective contractor must have adequate financial resources or the ability to obtain them during performance of the contract. Financial difficulties encountered by contractors may disrupt production schedules; cause waste of manpower and resources; and, if connected with guaranteed loans, advance payments or progress payments, result in a monetary loss to the government. It is, therefore, essential that a thorough review and analysis of a prospective contractor's financial condition be conducted prior to the awarding of the contract. When properly performed, this analysis will help the contracting official identify financially weak or high-risk contractors.

C. IDENTIFYING HIGH-RISK CONTRACTORS

While it is important that DOD make purchases and write contracts at the lowest possible price, it is not required to award a contract to a marginal supplier solely because the supplier submitted the lowest bid. The award of a contract on price alone would provide false economy if there were subsequent default by the contractor. For this reason, and depending upon the dollar value of the potential award, the cognizant contract administration office is required to perform an analysis of the contractor's management, financial stability, and facility resources to determine whether or not a contractor can be considered reliable. One measure of stability is the likelihood of bankruptcy. Previous studies by Beaver (1966), Altman (1968), Libby (1975), and Ohlson (1980) have examined the usefulness of accounting data in making predictions about corporate failure. In general, these studies have been analyses of the quantitative financial accounting information found in corporations' annual reports. The purpose of this thesis is to investigate another analytical technique that may be used for identifying high-risk contractors by using other information found in corporate annual reports. Specifically, it examines one form of content analysis, the paragraph completion test, to determine its usefulness in evaluating the information contained in the president's letter in the annual report as a basis for predicting the firm's potential for failure.

II. PREVIOUS BANKRUPTCY RESEARCH

During the past fifteen years, researchers such as Altman (1968), Beaver (1966, 1968), Blum (1972), Ohlson (1980), and Wilcox (1971) have been utilizing univariate and multivariate statistical techniques to assess the predictive ability of a large group of ratios. Some of the studies (Beaver, 1968; Blum, 1972; Wilcox, 1971) have found that, on an ex post basis, failed firms can be correctly classified about 90 percent of the time the year before bankruptcy. Independent variables usually include performance measures (e.g., net income to total assets), liquidity ratios (e.g., working capital to sales), leverage assessments (e.g., total liabilities to total assets), and funds flow analysis (e.g., cash flow to total liabilities). Other studies by Bruns (1966), Casey (1980), Libby (1975), and Zimmer (1980) have considered the behavioral impact of accounting measures and predictors on decision makers. In the following sections, four diverse methods that have been used in studying corporate failure are reviewed.

A. BEAVER'S RATIO STUDY

Beaver (1966) published the results of a study designed to provide an empirical verification of the usefulness or predictive ability of accounting data, specifically, financial statements. He developed a list of seventy-nine firms that

failed during the period 1954-1964 and paired them with an equal number of non-failed firms from the same industries and of approximately the same asset size. Financial statement data for each pair were obtained from Moody's Industrial Manual for five years prior to failure. From these data, thirty financial ratios were calculated and grouped into six major categories. After all thirty were analyzed, one ratio per category was selected as a focus for discussion. The ratios used were cash flow/total debt, net income/total assets, total debt/total assets, working capital/total assets, the current ratio, and the no-credit interval.

Beaver analyzed the data from three perspectives. First, he compared the mean values of the ratios for each pair of firms and developed a profile of the relationship of the ratios for both the failed and non-failed firms. Next, he performed a dichotomous classification test, using upper and lower critical values, that enabled him to determine the reliability of a given ratio to correctly indicate failure or non-failure. For his final test, Beaver used Bayes' Theorem to develop likelihood ratios for each financial ratio in the study. This measure indicated what change, if any, might occur in a user's prior probabilities (feelings) about the future of a firm once knowledge of the value of a given ratio had been made available to him.

Beaver found that, as bankruptcy approached, the ratio distribution of failed firms exhibited a marked deterioration,

while the ratios of non-failed firms remained stable. He also found that the cash flow/total debt ratio was the best predictor, exhibiting a classification error rate of only 13% in the year before failure and only 22% in the fifth year before failure. Finally, when financial ratios were used to calculate likelihood ratios, the cash flow/total debt ratio produced large likelihood ratios as far back as five years before failure. In a subsequent study Beaver (1968) concluded that the non-liquid asset measures predict failure better than the liquid asset measures and that not all accounting measures predict equally well. Thus, Beaver provided decision makers a range of choice among alternative measures on the basis of their relative predictive power.

B. ALTMAN'S "Z" FUNCTION

Responding to critics who questioned the ability of financial ratios to assess corporate performance accurately, Altman (1968) released a study that supported their continued use as predictors of corporate failure. However, he departed from the more traditional approach used by Beaver (1966 and 1968), which called for an examination of individual ratios in an effort to determine the best performer, and instead applied multiple discriminant analysis (MDA) to combinations of ratios. Altman states that combining ratios removes possible ambiguities and misclassifications that had been observed in previous studies.

Working from a list of twenty-two financial ratios, he condensed them to a five-ratio function that did the best overall job of predicting failure. The five ratios that made up Altman's "Z" function were working capital/total assets, retained earnings/total assets, earnings before interest and taxes/total assets, market value of equity/book value of total debt, and sales/total assets.

Based upon the analysis of a paired sample of thirty-three firms, which were classified by industry and asset size, Altman concluded that all of the ratios he observed showed deterioration as failure approached and that the most dramatic change for most of these ratios took place between the third and second years prior to failure. He further stated that his model was most accurate for each of the last two years before failure (95% for the first year before and 72% for the second), with accuracy diminishing substantially as the lead time increased.

Subsequent to this study, Altman (1971) published a book on bankruptcy that contained simplified instructions for using his technique. Thus, bankers, credit managers, executives and investors could make use of his "Z" function in the daily course of conducting their business.

C. LIBBY'S BEHAVIORAL APPLICATION

In order to test the relevance of ratio analysis in the decision making context, Libby (1975) performed a study to

evaluate jointly the predictive power of financial ratios as well as the ability of a group of bank loan officers to use them in predicting corporate failure. Twenty-seven bankers from large and small banks located in different communities were split into three groups. Each group was given the same set of ratios, which had been calculated on a paired sample of thirty failed and non-failed firms. The ratios were net income/total assets, current assets/sales, current assets/current liabilities, current assets/total assets, and cash/total assets. The bankers were informed that approximately one half of the firms they were analyzing had failed and were then required to classify each firm as either failed or non-failed within three years of the statement date. They were also asked to rate themselves on the confidence they had in their decision.

The purpose of Libby's study was to measure the consistency of interpretation of the ratios (1) within loan officers, by calculating their test-retest scores, and (2) between loan officers, by assessing the interrater reliability of their decisions. In addition, a composite score (consensus judge) was calculated by firm across subjects and was compared to the individual decision maker's average result.

In spite of widely diverse backgrounds and experience levels, the bankers were able to make highly accurate and reliable predictions of business failure. Libby concluded

that the traditional confidence placed in ratio analysis for predictive purposes seemed justified.

In a study otherwise similar to Libby's, Casey (1980) did not inform his subjects of the firms' frequency of failure rate. As a result of this difference, Casey reported performance results for predicting failure that were inconsistent with Libby's reported findings.

D. OHLSON'S PROBABILISTIC MODEL

The study performed by Ohlson (1980) differs in several ways from the majority of published work on predicting corporate failure. Ohlson's data came from the period 1970 to 1976; almost all previous studies took data from the decade of the sixties. This study also examined a considerably larger number of firms (105 failed and 2,058 non-failed) than have most other researchers, and they were not paired by failed and non-failed firms. The source for his data was also different. Rather than using the summary financial data found in Moody's Industrial Manual, Ohlson obtained copies of the firm's annual report (Form 10-K) to the Securities and Exchange Commission (SEC). This source enabled him to determine whether the firm had entered bankruptcy before or after its financial statements had been made available to the general public. If he found that a firm had released its statements after having filed for bankruptcy, that firm was excluded from the study on the

basis that a realistic evaluation of a model's predictive relationships requires that the predictors (financial accounting data) be available for use prior to the event of failure. Ohlson noted that this important timing difference had been ignored in most other bankruptcy studies. Also, he used conditional logit analysis to examine the data, which was different from previously used techniques.

Ohlson's fundamental research question was this: given that a firm belongs to some prespecified population, what is the probability that the firm fails within some prespecified time period? He found that the size of the firm as well as some measure(s) of its financial structure, performance, and liquidity were all statistically significant in assessing the probability of failure within one year. The independent variables he specified were (1) size = $\log(\text{total assets}/\text{GNP price-level index})$, (2) total liabilities/total assets, (3) working capital/total assets, (4) current liabilities/current assets, (5) net income/total assets, (6) an indication of whether or not total liabilities exceeded total assets, (7) funds provided by operations/total liabilities, (8) an indication of whether or not net income had been negative during the previous two years, and (9) the change in net income for the most recent period.

Ohlson concluded that the predictive power of any model depends upon when the information (financial report) is

available. Further, he found that the predictive powers of ratios appear to be robust across estimation procedures when applied to a large sample of data.

E. SUMMARY

Of the studies reviewed, no two were alike. All of them examined the use of financial ratios and other accounting data as predictors of failure, but each was unique in that different data sets were used; different analytical techniques were employed; varying levels of predictability were attained; and different conclusions were reached. The purpose of this thesis is to take yet another approach to the investigation of corporate failure, one that involves analyzing information of a qualitative nature. The process of classifying qualitative material into appropriate categories for description and further analysis is known as content analysis, which is the topic of the next chapter.

III. PREVIOUS BEHAVIORAL RESEARCH

Most of the research investigating corporate failure has been performed by conducting analyses of the quantitative data contained in financial statements. However, other public information may exist that is useful for the analysis and prediction of corporate failure. Weick (1983) has suggested that research in psychology and political science may be useful in the analysis of accounting questions. Specifically, Weick suggested that research dealing with conceptual complexity and individual behavior in stressful situations may provide a useful basis for the analysis of accounting questions.

A. CONCEPTUAL COMPLEXITY THEORY

Conceptual complexity theory states that individuals differ along a scale ranging from simple to complex with respect to how they process information, communicate and make decisions. Suedfeld, Tetlock, and Ramirez (1977) state that one's level of conceptual complexity is a function of three components. The first is discrimination, which is the ability to identify the differences present in an environment. Second is differentiation, which is the ability to perceive various levels or dimensions in the environment. The third component is integration, which is how the

differentiated aspects of an environment are combined for use in the decision-making process. In evaluating conceptual complexity, differentiation and integration are considered to be the crucial components, with differentiation being a necessary prerequisite for integration.

Individuals with low levels of conceptual complexity tend to think in strict categorical terms and, generally speaking, recognize only a limited number of alternatives, which they tend to arrange in a strictly compartmentalized manner. Ambiguity and conflict are avoided where possible, and selected alternatives are usually dealt with in absolute terms. By contrast, individuals who demonstrate high levels of conceptual complexity tend to recognize subtle differences in the environment and are able to perceive a full range of alternatives, which relate to one another in a complex, interwoven framework. Conflict and ambiguity are put to use in order to gain additional information about the environment, which in turn may be used in formulating new alternatives.

As noted by Schroder et al. (1967), the complexity of information-processing varies as a function of environmental variables such as stress, novelty or uncertainty. A number of other studies (Holsti, 1972; Janis, 1972; Selye, 1956; Suedfeld, 1964) have arrived at the same basic conclusion. Further, as noted by Suedfeld and Tetlock (1977), there

appears to be general agreement among researchers that prolonged stress decreases the complexity of information-processing. Of the various measurement techniques available, Suedfeld and Tetlock (1977) and Suedfeld, Tetlock, and Ramirez (1977) found that the Paragraph Completion Test (PCT) provided an accurate measure of this trait.

The PCT measures an individual's level of conceptual complexity by scoring paragraphs that the individual has completed. As originally designed, the paragraphs are generated by giving an individual a set of incomplete sentences and asking that individual to complete the paragraphs. The topics usually pertain to some crucial aspect of the decision-making process. Approximately two minutes are allowed for the completion of each of the paragraphs. Upon completion of the test, each paragraph is scored for conceptual complexity. Scoring is based on a scale of one to seven, where one equals low complexity, three equals moderately low complexity, five equals moderately high complexity, and seven equals high complexity. Scores of two, four or six are allowable for paragraphs that are borderline cases. The training of scorers is a critical variable, and, according to Schroder, Driver, and Streufert (1967), an interrater reliability of .80 or better is the accepted standard to ensure reliable and accurate results.

B. INTEGRATIVE COMPLEXITY

Suedfeld, Tetlock, and Ramirez (1977) found that the PCT was just as accurate at assessing the complexity of archival materials as it was at assessing the complexity of individual responses. In this context, however, differentiation and integration were viewed as aspects of information processing rather than as personality variables. As such, the output of the PCT became a measure of the level of integrative complexity inherent in a situation as opposed to an individual's measured level of conceptual complexity. In particular, they found that simplification of information-processing regularly occurs where stress is building toward conflict. These results were based upon a study of speeches made to the United Nations General Assembly by delegates from Israel, Egypt, Syria, the United States, and the Soviet Union.

The study was designed to test if integrative complexity in the speeches decreased in the months prior to periods of conflict. Five to fifteen paragraphs from each speech delivered during the period 1947 to 1976 were randomly selected and scored by three trained scorers. Listings of facts and other purely descriptive passages were omitted from the sample, and overlap scoring was performed to ensure interjudge reliability was .85 or better. Finally, the mean integrative complexity scores were correlated and an analysis of variance (ANOVA) performed.

From this analysis, Suedfeld, Tetlock, and Ramirez found that the complexity of information-processing was significantly reduced in speeches made during the months preceding the outbreak of conflict. Specifically, as relations deteriorated and stress increased, speeches became simpler, more repetitious and less differentiated. As a result of the data obtained from this study, they concluded that the Paragraph Completion Test appeared to be useful in predicting future events on the basis of integrative complexity scores.

C. CONCEPTUAL COMPLEXITY THEORY AND BANKRUPTCY PREDICTION

Conceptual complexity theory, in its broadest sense, addresses the question of how information is processed. As applied to historical information, conceptual complexity theory provides an explanation of the integrative complexity prior to "stressful" situations. The Paragraph Completion Test (PCT) provides a measure of an individual's level of conceptual complexity as well as an assessment of the level of integrative complexity present in a given environment (Suedfeld, Tetlock, and Ramirez, 1977). In either case, the presence of stress generally results in low complexity scores.

A firm approaching bankruptcy is, in some respects, like a nation approaching conflict. In that regard, a firm's management may, as failure approaches, exhibit some of the characteristics noted in the leaders of nations approaching conflict. For example, long-term plans may be ignored in

favor of reacting to the immediate crisis; unpleasant inputs may be suppressed or ignored; the ability to distinguish between relevant and irrelevant information may be impaired; the ability to make fine distinctions among items of information may be abandoned in the face of crisis; and responses and attitudes may become increasingly stereotyped (Suedfeldt and Tetlock, 1977). If this is so, it could be expected that the published information of a corporation might, as its financial condition gets progressively weaker, reveal less integrative complexity than when the corporation was financially healthy. A published document that relates directly to corporate financial health is the president's cover letter to the annual report to stockholders.

Environmental factors unrelated to financial failure might cause changes in the levels of integrative complexity for both failing and stable firms. That being the case, it might prove meaningful to compare the levels of integrative complexity between a failed and a non-failed firm from the same industry, of approximately the same asset size, and over the same time period. In so doing, it would be possible to observe the relative changes in the levels of integrative complexity unique to the failing firm.

Based upon the above discussion, it could be expected that, given two similar firms, one approaching bankruptcy and one not, the level of integrative complexity of the

president's letter for the firm approaching bankruptcy will be relatively lower than that of the financially healthy firm. Stated as specific, testable hypotheses:

(a) As failure of the firm approaches, the integrative complexity score of the president's cover letter will decrease absolutely.

(b) As failure of the firm approaches, the integrative complexity score of the president's cover letter will be lower relative to that of the non-failing firm.

IV. DESIGN

The design used in this thesis is similar to that used by Beaver (1966). Data were collected on a sample of twenty failed and non-failed firms over the five-year period preceding the year in which the failed firm filed for bankruptcy. Matching criteria required that paired firms be from the same industry and of approximately the same asset size. Pairing was done to provide control for variables other than the impending bankruptcy. The source for all of the sample data was the Stanford University Business Library.

A. SELECTION OF FAILED FIRMS

It was originally intended that the list of failed firms for this thesis would be taken from a previous paired bankruptcy study. However, only one of the studies reviewed that used a paired sample design (Wilcox, 1971) disclosed the names of the firms studied. The Wilcox study included firms that failed during the period 1948 to 1972. By comparing his list to the annual reports on file at Stanford, it was determined that not enough of the reports for these firms were available to enable an adequate sample to be drawn.

The Altman (1982) study, while not a paired analysis, did list the names of the firms being examined. Firms that entered bankruptcy during the period 1970 to 1982 were

included in the study. Sufficient numbers of the annual reports for these firms were available in the Stanford library so that Altman's list could be used for developing a sample. The process used to develop the sample of failed firms was a three-step process. First, starting with the most recently reported failures, a potential firm was looked up in the card file and, once found, was accepted only if the annual reports for the five-year period preceding failure were listed as being on file. Second, Moody's Industrial Manual was used to determine each firm's principal line of business and to identify its approximate asset size for the year before failure. Third, the Office of Management and Budget's (OMB) Standard Industrial Classification Manual was referred to, and each firm, based on its principal line of business, was assigned a three-digit SIC code. This process was repeated until a sample of twenty failed firms had been developed, each having been classified by industry and asset size.

B. . SELECTION OF NON-FAILED FIRMS

Having selected the failed firms, the next step was to develop a matching list of non-failed firms. Moody's Industrial Manual, which provides an alphabetical listing as well as a listing of firms by product line, was referred to in order to identify a set of prospective non-failed firms for each failed firm already identified. The set of

non-failed firms was checked to determine if their annual reports were on file in the Stanford library. For those that were, the same procedures used for the failed firms were followed in assigning each non-failed firm an SIC code and in determining its approximate asset size. If the SIC code for the non-failed firms did not match the failed firm's SIC code, that non-failed firm was eliminated from the prospective set. Of those non-failed firms remaining in the set with the same SIC code as the failed firm, the one closest in asset size to its failed counterpart was selected. This process was repeated until a list of twenty pairs of matching failed and non-failed firms was developed.

Copies of the presidents' cover letters for the entire sample were made, arranged in pairs, and sequentially numbered. One annual report each for two non-failed firms, although listed as being on file in the Stanford library, could not be located. These cover letters for these reports were not included in the sample and were ultimately treated as unscored data points. Finally, the cover letters were then randomly arranged in preparation for eventual scoring. This step was done in order to eliminate any bias in scoring that might have occurred had the ordered pairs of firms been scored.

C. SCORING FOR INTEGRATIVE COMPLEXITY

Copies of the presidents' cover letters for each pair of firms for the five-year period preceding bankruptcy were scored for integrative complexity. However, not every paragraph in each letter was scored. Purely descriptive passages or lists of facts were omitted from scoring. To be considered scorable, a paragraph had to offer an analysis or explanation of some event or of operations in general and address both the what and why of the situation. Explanations could relate to the past, the present, or the future.

Having met this criterion, the scorable paragraphs were assigned scores ranging from one to seven, where one equals low integrative complexity, three equals moderately low integrative complexity, five equals moderately high integrative complexity, and seven equals high integrative complexity. Scores of two, four, or six were assigned in those instances where some qualities of the next higher score were present but not pronounced enough to put the score at that level. Following is a brief description of the characteristics of each of the four basic scores.

1. Low Integrative Complexity (scale value 1)

Passages of this type are characterized by anchored or rigid thinking; statements of an absolute nature; indications of the presence of strict categorical thinking; a tendency to externalize the causes of the current situation; and a tendency to minimize conflict and resist ambiguity.

2. Moderately Low Integrative Complexity (scale value 3)

Passages of this type are characterized by a recognition of possible alternative conditions and a movement away from absolutism. Still, the alternate states that are recognized tend to be relatively few, and they are generally viewed as being isolated from one another. Rigidity of thought exists and is evidenced in the ways that alternatives are narrowly selected, with all but the chosen alternative being ruled out. Some recognition of the firm's ability to control its destiny is evidenced by the generation of various possible courses of action.

3. Moderately High Integrative Complexity (scale value 5)

Passages at this level are characterized by the recognition of a number of alternatives that are part of a complex, interconnected network. Control is more evident by the recognition and generation of a wider number of choices. Flexibility is generally demonstrated in dealing with these choices. Thinking at this level is generally more abstract, as evidenced by the ability to deal with multiple alternatives simultaneously.

4. High Integrative Complexity (scale value 7)

Passages of this type are characterized by an extreme level of abstract thinking that allows for the simultaneous functioning of many alternate, interactive processes. Change and ambiguity are recognized as catalysts

for new alternate solutions. Diversity is evidenced by the ability to generate and handle many alternate and complex environmental variables. Rather than being controlled by externalities, rules and processes are generated from within.

After an initial training period of approximately ten days, scoring began and was carried out over a several-week period. All annual reports were scored by one rater (the author) who was aware of the hypotheses being tested and of the identity of the failed and non-failed firms. However, given that the 200 cover letters were randomly arranged and scored in small groups over a six-week period, it is unlikely that objectivity was significantly impaired by his prior knowledge of the sample. An additional rater (the thesis advisor) scored approximately one-fourth of the sample to provide a mean to determine interrater reliability.

Two dimensions of the rater's reliability were of concern: (1) the selection of paragraphs for scoring and (2) the scoring for integrative complexity. Since the cover letters were not screened beforehand to determine which of the paragraphs in each of the presidents' cover letters would or would not be scored, the decision was made independently by each rater. The resulting level of interrater reliability for scored paragraphs was 0.87. In regard to the second concern, where differences did exist as to which paragraphs were selected for scoring, only the scores for

the commonly scored paragraphs were considered in calculating interrater reliability. A rule of thumb used for determining an acceptable level of interrater reliability for paragraph scores is 0.80 (Schroder, Driver and Streufert, 1967). The level of interrater reliability achieved for integrative complexity scores for this thesis was 0.79. Although below the recommended level, the difference is minimal.

V. ANALYSIS, RESULTS, AND CONCLUSIONS

A. DATA PREPARATION

Table 1 displays the distribution of scored and unscored paragraphs for the sample. Of the 2,308 paragraphs evaluated, 598 were scored and 1,710 were not scored. The number of scored paragraphs per cover letter ranged from 0 to 13, with a mean of 2.99. The number of unscored paragraphs per cover letter ranged from 0 to 30, with a mean of 8.55. One hundred and seventy-six of the 198 cover letters contained at least one or more scored paragraphs.

TABLE 1

Distribution of Scored and Unscored Paragraphs

<u>Years Before Bankruptcy</u>	<u>Scored Paragraphs</u>	<u>Unscored Paragraphs</u>
1	118	289
2	118	359
3	139	371
4	129	342
5	94	349
	<hr/> 598	<hr/> 1,710

Cover letters evaluated-	- - - - -	200
Paragraphs evaluated -	- - - - -	2,308
Mean paragraphs scored -	- - - - -	-2.99
Mean paragraphs unscored -	- - - - -	-8.55

Twenty-two of the cover letters were purely descriptive in nature, containing no scorable paragraphs. Two cover letters were missing from the sample, one each from two non-failed firms. As shown in Table 2, the unscored cover letters were distributed throughout the sample. Eight firms, three failed and five non-failed, had one unscored or missing cover letter each. Six firms, three failed and three non-failed, had two unscored letters each. And one non-failed firm had four unscored cover letters. One pair of firms had a total of six unscored cover letters, two attributable to the failed firm and four attributable to the non-failed firm. Given that the majority of the cover letters were unscorable for the non-failed firm, this pair was excluded from the sample during the subsequent analyses. The remaining fourteen unscorable cover letters, along with the two missing cover letters, were treated as missing data points. Their scores were subsequently estimated by the mean score for their particular year and group.

B. ANALYSIS PROCEDURE

Given that this experiment consisted of multiple observations (i.e., the president's letters) on a single experimental unit (i.e., the firm), a repeated measures design was used. The design consists of two factors: type of firm and years. The first factor, type of firm, has two levels: failed and non-failed. The second factor has five levels or years.

TABLE 2

Distribution of Unscored or Missing Cover Letters

<u>Number of Unscored Cover Letters</u>	<u>Failed Firms</u>	<u>Non-failed Firms</u>
0	14	11
1	3	5
2	3	3
3	0	0
4	0	1
5	0	0

Note: The two missing cover letters came from separate non-failed firms.

The various analytical procedures used in this study were accomplished through the use of an IBM 3033 computer and the Statisticak Package for the Social Sciences (SPSS).

C. RESULTS

Hypothesis (a): As failure of the firm approaches, the integrative complexity score of the president's cover letter will decrease absolutely.

Table 3 displays the mean integrative complexity scores for both failed and non-failed firms. Figure 1 is a graphical representation of the scores. The decrease in the integrative complexity scores for failed firms was not significant ($p < 0.769$), as shown in Table 4. Given these test results, hypothesis (a) was rejected.

TABLE 3

Mean Integrative Complexity Scores for Firms

<u>Years Before Bankruptcy</u>	<u>Failed Firms</u>	<u>Non-failed Firms</u>	<u>Entire Sample</u>
1	2.6254	2.9562	2.7908
2	2.3787	3.3636	2.8712
3	2.5244	3.2216	2.8730
4	2.4946	2.9191	2.7069
5	2.4298	3.0659	2.7479

TABLE 4

Statistics for Test of Hypothesis (a)

<u>Source of Variation</u>	<u>Wilks Lambda.</u>	<u>F Statistic</u>	<u>Significance of F</u>
Constant	--	1332.07049	0.0
Year	0.89230	0.45262	0.769

Hypothesis (b): As failure of the firm approaches, the integrative complexity score of the president's cover letter will be lower relative to that of the non-failed firm.

Referring again to Figure 1, it can be observed that the integrative complexity scores of the failed firms remained

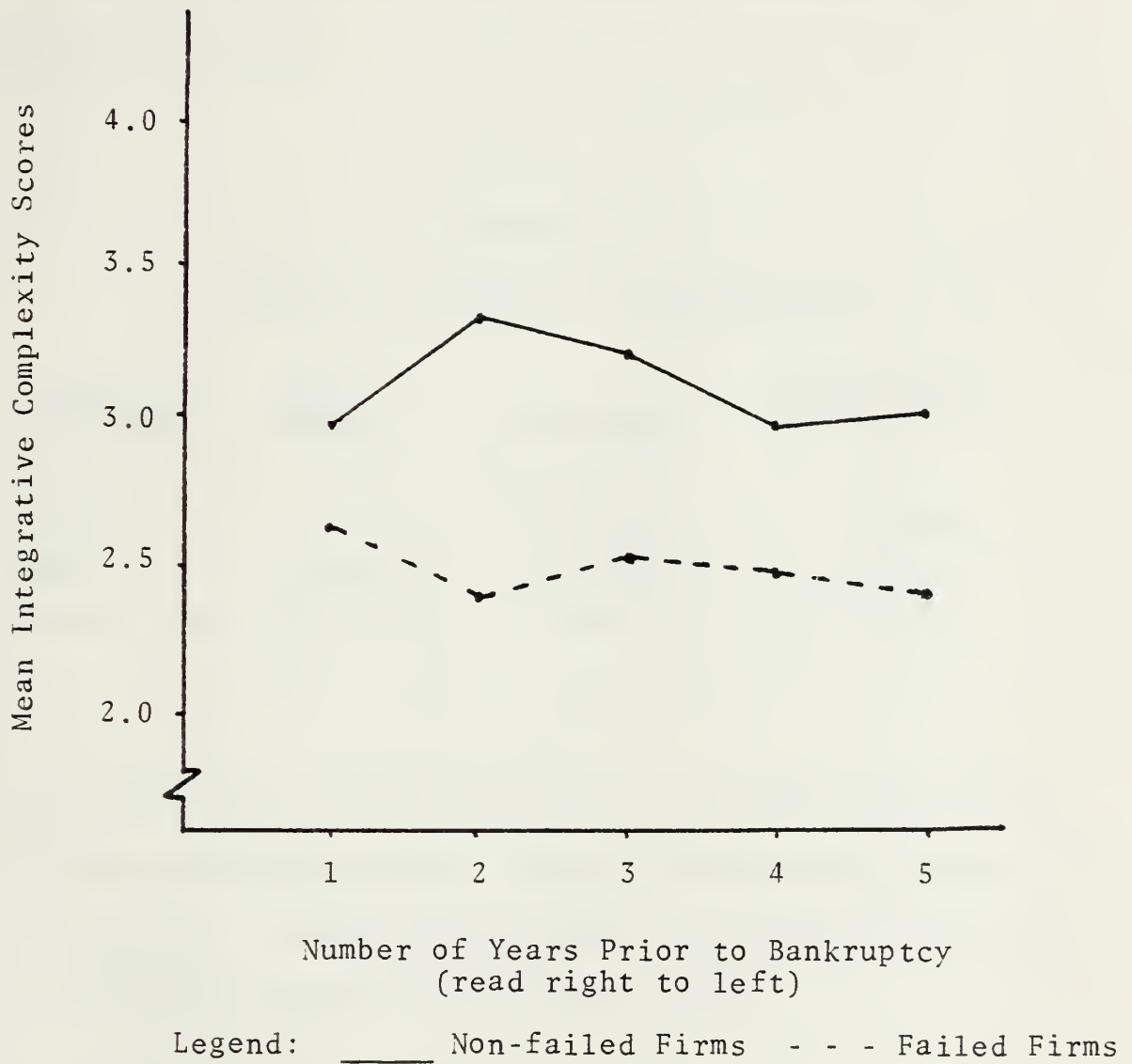


FIGURE 1

Graph of Mean Integrative Complexity
Sources for Failed and Non-failed Firms

consistently lower than those of the non-failed firms as bankruptcy approached. As shown in Table 5, the overall F statistic was 15.71524, significant at ($p < 0.0001$). On the basis of these experimental results, hypothesis (b) cannot be rejected.

TABLE 5
Statistics for Test of Hypothesis (b)

<u>Sources of Variation</u>	<u>Wilks Lambda</u>	<u>F Statistic</u>	<u>Significance of F</u>
Constant	--	1302.29071	0.0
Group	--	15.71524	0.0005
Year	0.94926	0.49902	0.737
Group & Year	0.86535	1.28374	0.296

The mean integrative complexity scores for each of the years were then contrasted. Table 6 presents the results of the contrasts. As might be expected, the significance of the difference in each of the years varied.

D. DISCUSSION AND CONCLUSIONS

This thesis was designed to investigate the usefulness of qualitative data found in annual reports in making predictions about corporate failure. The results of the experiment were mixed. The first hypothesis could not be supported.

TABLE 6

Difference of Years Contrasts for
Mean Integrative Complexity Scores

<u>Years Before Bankruptcy</u>	<u>Failed Firms</u>	<u>Non-failed Firms</u>	<u>F Statistic</u>	<u>Significance of F</u>
1	2.6254	2.5962	1.587	0.2159
2	2.3787	3.3636	13.011	0.0009
3	2.5244	3.2216	9.456	0.0040
4	2.4946	2.9191	2.701	0.1090
5	2.4298	3.0659	7.133	0.0113

However, the second hypothesis was supported. The results indicate that, while the complexity of language in the presidents' cover letters for failing firms does not decrease as bankruptcy approaches, the integrative complexity scores for failing firms are consistently lower than those of the non-failing firms as failure approaches. Although it is possible for rater bias to have influenced the results, the process of randomization of the cover letters and lack of familiarity with the specific firms in question helped to minimize the possibility of such a bias. Additionally, during the scoring process, which took place over a six-week period, the relative scores within or between firms were not discussed by the raters.

The fact that the results of this experiment are not strictly supportive of the theory underlying the concept of integrative complexity may be attributable to at least two factors, or to some interaction of the two factors. The first is sample size. If replicated with a larger sample size, the results obtained might show a trend of integrative simplification in reporting as failure approaches. The second factor is the length of the time period from which the sample was drawn. While the sample size for this experiment might well have been adequate, the time period from which the data were gathered may have been too short. The theory suggests that the populations should be the same for the failed and non-failed firms at some point in time and that, as bankruptcy approaches, the presidents' cover letters for failing firms would begin to exhibit a trend of integrative simplification (Suedfeld, Tetlock, and Ramirez, 1977). However, the process of integrative simplification in financial reporting under stress may be so gradual that a study encompassing a period of longer than five years might be required before a clearly decreasing trend could be detected.

Previous bankruptcy studies by Beaver (1966) and Wilcox (1973), which were based upon analyses of financial ratios, reported that firms could be classified as failing or non-failing most accurately within one year of failure, with predictive accuracy steadily diminishing through the fifth

year before failure. With the techniques of Beaver and Wilcox, the risk of misclassifying a firm as belonging to either the failinr or the non-failing population is greater five years before failure than in the year before failure. The technique used in this thesis might offer an advantage over the aforementioned techniques, in that the difference in the populations was significant over the entire five-year period. While this does not allow the analyst to predict in which year the firm might fail, it does give an indication at least as early as five years ahead of time that a firm may be headed for failure.

APPENDIX A
FAILED AND NON-FAILED FIRMS

Failed Firm	Bankruptcy Filing Date	Non-failed Firms
Lionel Corp.	2/82	Arrow Electronics
Commonwealth Oil Refining	7/79	Husky Oil, Ltd.
United Merchants and Manufacturers	77	Burlington Ind.
Flock Industries, Inc.	4/77	Georgia Bonded Fibers
Fields Plastic and Chemical, Ind.	7/77	VersaTech, Inc.
National Shoes	12/80	Craddock-Terry, Inc.
City Stores	7/79	Dillard Dept. Stores
E. C. Ernst	12/78	Technical Opns., Inc.
Garcia Corp.	6/78	Shakespeare, Inc.
General Recreation	12/78	Outdoor Industries
Goldblatt Bros.	6/81	Ames Dept. Stores
Lafayette Radio Electronics	1/80	Lloyds Electronics
Mansfield Tire and Rubber Company	10/79	Aegis Corp.
Piedmont Industries	2/79	Damon Creations
Richton International	3/80	Swank, Inc.
Sambo's Restaurants, Inc.	6/81	Denny's Inc.
Bobbie Brooks	1/82	Leslie Fay, Inc.
Tenna	12/78	Automatic Radio Mfg.
Allied Supermarkets	11/78	Scot Lad Foods, Inc.
Gruen Industries	4/77	Benrus, Inc.

BIBLIOGRAPHY

- Altman, E. I., "Accounting Implications of Failure Prediction Models," Journal of Accounting, Auditing, and Finance, Vol. 6, No. 1, Fall 1982, pp. 4-19.
- Altman, E. I., Corporate Bankruptcy in America (Lexington: Heath Lexington Books, 1971).
- Altman, E. I., "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy," Journal of Finance, Sept. 1968, pp. 589-607.
- Assistant Secretary of Defense (Installations and Logistics), Defense Acquisition Regulation, 1976 edition.
- Beaver, W. H., "Alternative Accounting Measures as Predictors of Failure," The Accounting Review, Jan. 1968, pp. 113-122.
- Beaver, W. H., "Financial Ratios as Predictors of Failure," Empirical Research in Accounting: Selected Studies, 1966, pp. 71-102.
- Beaver, W. H., "Market Prices, Financial Ratios, and the Prediction of Failure," Journal of Accounting Research, Autumn 1968, pp. 179-192.
- Blum, M., "Failing Company Discriminant Analysis," Journal of Accounting Research, Spring 1972, pp. 1-25.
- Bruns, W., "The Accounting Period and its Effect upon Management Decisions," Empirical Research in Accounting: Selected Studies, 1966, pp. 1-14.
- Bureau of National Affairs, "DOD Seeks Wider Use of Commercial Products," in Federal Contract Report, Vol. 39, No. 12, pp. 649, 677 (Washington, D.C., March 21, 1983).
- Cartwright, Darwin P., "Analysis of Qualitative Materials," in Research Methods in the Behavioral Sciences, Leon Festinger and Daniel Katz, eds. (Holt, Rinehart & Winston: New York, 1966).
- Comptroller General of the United States, "Defense Budget Increases: How Well Are They Planned and Spent?" in Report to Congress, PLRD-82-62 (Washington, D.C., April 13, 1982).

- Deakin, E. B., "A Discriminant Analysis of Prediction of Business Failure," Journal of Accounting Research, Spring 1972, pp. 168-179.
- Edmister, R. Q., "An Empirical Test of Financial Ratio Analysis for Small Business Failure Prediction," Journal of Financial and Quantitative Analysis, March 1972, pp. 1477-1493.
- Harvey, O. J., D. E. Hunt, and H. M. Schroder, Conceptual Systems and Personality Organization (John Wiley, New York, 1961).
- Hofstede, T. R., "Some Behavioral Parameters of Financial Analysis," The Accounting Review, Oct. 1972, pp. 679-692.
- Libby, R. and B. L. Lewis, "Human Information Processing Research in Accounting: The State of the Art," Accounting, Organizations and Society, Vol. 2, No. 3, pp. 245-268.
- Libby, R., Accounting and Human Information Processing: Theory and Applications, (Prentice-Hall, Inc., New Jersey, 1981).
- Libby, R., "Accounting Ratios and the Prediction of Failure: Some Behavioral Evidence," Journal of Accounting Research, Spring 1975, pp. 150-161.
- Moyer, C., "Forecasting Financial Failure: A Re-Examination," Financial Management, Spring 1977, pp. 11-17.
- Norton, C. L. and E. Smith, "A Comparison of General Price Level and Historical Cost Financial Statements in the Prediction of Bankruptcy," The Accounting Review, Jan 1979, pp. 72-87.
- Ohlson, J. A., "Financial Ratios and the Probabilistic Prediction of Bankruptcy," Journal of Accounting Research, Spring 1980, pp. 109-131.
- Schroder, H. M., M. J. Driver, and S. Streufert, Human Information Processing (Holt, Rinehart & Winston, New York, 1967).
- Suedfeld, P. and P. E. Tetlock, "Integrative Complexity of Communications in International Crises," Journal of Conflict Resolution, March 1977, pp. 169-184.

- Suedfeld, P., P. E. Tetlock, and C. Ramirez, "War, Peace, and Integrative Complexity," Journal of Conflict Resolution, Sept. 1977, pp. 427-441.
- Wilcox, J. W., "A Prediction of Business Failure Using Accounting Data," Empirical Research in Accounting: Selected Studies, 1973, pp. 163-173.
- Wilcox, J. W., "A Simple Theory of Financial Ratios as Predictors of Failure," Journal of Accounting Research, Autumn 1971, pp. 389-395.
- Winans, R. F., "Firms Under Chapter 11 May Offer Investors Some Above-Average Returns, Analyst Says," The Wall Street Journal (January 4, 1983), p. 51 (in Western Edition).

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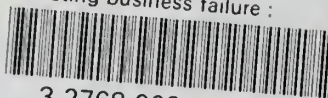
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